Silviculture with Birds in Mind

Options for Integrating Timber and Songbird Habitat Management in Northern Hardwood Stands in Massachusetts

Adapted from Vermont's *Foresters for the Birds* Project

Table of Contents

Over 100 foresters and biologists collaborated in the creation of this document and others created through the Foresters for the Birds *project.*

Introduction

This publication has been prepared to assist foresters interested in silviculture that integrates timber and songbird habitat management in northern hardwood and associated forest stand types in Massachusetts. Information provided here is intended to support both the creation of Stewardship and Current Use (Ch61, Ch61A, Ch61B) forest management plans and subsequent implementation of on-the-ground, stand-level management activities that can benefit breeding bird populations while producing timber products.

The Vermont *Foresters for the Birds* Project is a collaborative partnership between the Vermont Department of Forests, Parks, and Recreation and Audubon Vermont. The Vermont toolkit documents were developed over a period of two years by staff of these two organizations in collaboration with over 100 foresters participating in the project.

These Massachusetts documents have been adapted for the northern hardwood forest type in Massachusetts from the Vermont *Foresters for the Birds* Project in consultation with Audubon Vermont. The Vermont documents were reviewed by Massachusetts biologists and foresters and small changes were made to better reflect the forest conditions and bird populations in Massachusetts.

This document is intended to be used in conjunction with its two companion documents: *Forest Bird Habitat Assessment Guide: A Guide to Integrating Bird Habitat Data into a Massachusetts Forest Inventory* and *Birds with Silviculture in Mind: Birder's Dozen Pocket Guide for Massachusetts Foresters.*

Our purpose is to provide guidance to practicing foresters for integrating bird habitat management concepts with widely applied silvicultural treatments. This is not a guide to managing for songbird habitat. Rather this document enumerates the bird species that are potential beneficiaries of specific timber management practices.

This publication does not describe all the potential forest management activities that could be conducted to achieve desired habitat conditions for birds. Instead, it offers descriptions of some basic management practices that incorporate accepted songbird habitat concepts into silvicultural practices. These are intended to compliment the forester's application of existing silvicultural guides such as "Silvicultural Guide for Northern Hardwood Types in the Northeast (revised)" (NE-603). The silvicultural options described combine information from a wide range of sources including primary literature in silviculture, forest ecology, avian ecology, habitat management, and conservation biology as well as from the experience of practicing foresters and biologists in Massachusetts, Vermont, and other New England states.

Forest management has a direct and significant influence on bird populations. Subtle shifts in forest management objectives and strategies can bring important bird benefits in the residual stand, especially when these subtleties are discovered during inventory, spelled out in the management plan, and implemented during management activities.

In many cases, implementing the silvicultural options in this guide involves changes that will be more subtle than sweeping. Indeed, many such considerations are already being incorporated into stand-level silviculture in Massachusetts. While this document focuses on northern hardwood and associated community and cover types, it is intended to be adaptable for use in other forest types as well.

Massachusetts Forest Birds

About 200 species of birds breed in Massachusetts every year. Identifying all of them by sight and sound is a daunting task, even for expert birders. A simpler starting point for those interested in managing with birds in mind is the Massachusetts Birder's Dozen.

The Birder's Dozen is 12 of the 40 breeding mature and young forest birds that have been identified by the National Audubon Society as being high priorities for protection in the Northern Forest Region and the Eastern Deciduous Forest Region (see complete list on page 22). These twelve species were selected because they:

- Are relatively simple to identify by sight and/or sound.
- Collectively use a wide range of forest types and conditions for feeding and for breeding.
- Are common in Massachusetts forests.
- Have a significant portion of their global population breeding in the Northern Forest Region or the Eastern Deciduous Forest Region.

Although the silvicultural options have the potential to affect a wide diversity of forest birds and other wildlife, for simplicity and consistency, the Birder's Dozen are referenced most often. You can read about all of these species in the Massachusetts Breeding Bird Atlas 2, found at www.massaudubon.org/birdatlas/bba2.

Contact your DCR Service Forester or Mass Audubon with questions about how to become involved in the Foresters for the Birds project or for further assistance, Google – MA DCR Service Forestry or visit http://www.massaudubon.org/

Acknowledgements

Funding for adapting this publication to Massachusetts was provided through the DCR Working Forest Initiative. Thanks to Jim Shallow, Kristen Sharpless, and Steve Hagenbuch at Audubon Vermont for their help in adapting this document.

The original project on which this publication was based was supported by the Northeastern Area State and Private Forestry, U.S. Forest Service and TogetherGreen, an Audubon program with funding from Toyota. Thanks to all the foresters participating in the Foresters for the Birds project who provided feedback on the Vermont document. Forest photos courtesy of Alison Wright-Hunter, Michael C. Snyder and Kristen Sharpless. Bird photos courtesy of John Harrison, David Larson, Sheila Carroll, Mark Thorne, and Richard Johnson.

Massachusetts Forests: Desired Conditions and Important Habitat Considerations

The long and short-term goals for the Foresters for the Birds project in Massachusetts are to provide healthy forests that provide suitable breeding and post-breeding habitat conditions for a suite of Massachusetts birds and that through sustained, careful, and long-term management can also support timber harvests. The forest will be well stocked with dominant and co-dominant acceptable growing stock (AGS).

Achieving these goals requires stand-level silvicultural treatments (such as the options presented in this publication) that are intended to reach short-term (10-15 years) management objectives. Repeated application of these treatments over the long- term (100+years) is intended to move overall forest conditions toward achieving the following goals for a range of important forest attributes.

Landscape View

Maintain extensive forest cover

Heavily forested landscapes (70+% forest cover) provide the greatest quantity, diversity, and quality of habitat for priority birds compared to fragmented and/or developed landscapes.

Maintain large and connected forest blocks

Large (>2500 acres) patches of contiguous forest provide the highest quality habitat for interior-nesting birds like Wood Thrush that reproduce more successfully away from edges and development. Smaller forest patches >500 acres in size provide important habitat in more fragmented landscapes and can connect larger patches. For interior forest habitat see Biomap 2 critical natural landscapes http://www.mass.gov/eea/agencies/dfg/dfw/natural-heritage/land-protection-and-management/biomap2/.

Diversity of forest age classes

A predominantly mature forested landscape punctuated by patches of young regenerating forest will provide the diversity of age classes that will benefit a wide variety of bird species with a range of nesting and foraging opportunities. Early-successional habitat, which includes young forest, should include small (<2.5-5 ac), and large (>5 ac) patches, comprising up to 10% of the forested landscape at any given time (Litvaitis 2006). Over time this will create a mix of successional stages creating a habitat mosaic at the landscape level. In a heavily forested landscape, this horizontal structural diversity, combined with the presence of wetland complexes and riparian areas, will support all twelve Birder's Dozen species.

Forest Habitat Attributes

MATURE FOREST

For the purposes of forest bird habitat, a mature forest has a canopy greater than 20-30 feet in height with greater than 70% canopy closures. High-quality mature forest habitat also includes the following features:

Complex Vertical Structure

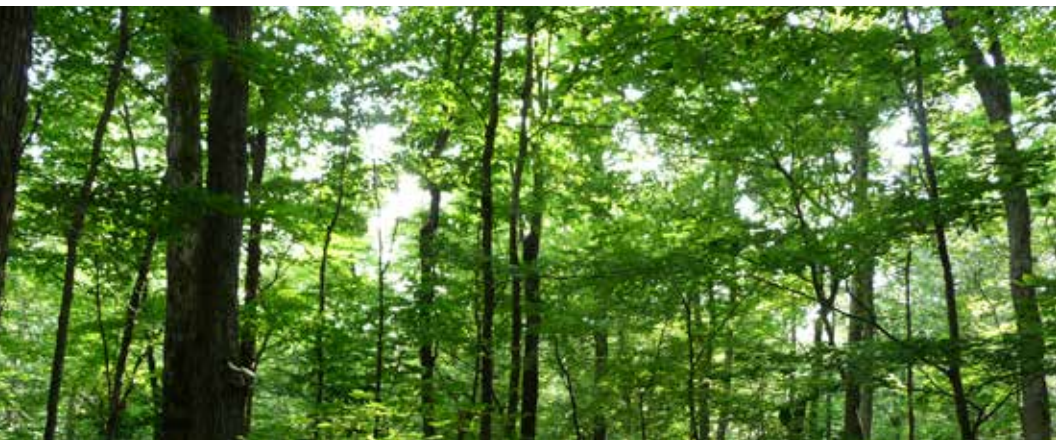
Enhanced vertical structure provides the greatest number of bird species with the greatest number of nesting and foraging opportunities within a forest stand. All forest layers should be present in moderate to high amounts distributed throughout the stand: canopy, midstory, understory, and ground layers. Patches of very dense native shrub and understory layers (0-5 feet in height) are of particular nesting importance to bird species such as the Black-throated Blue Warbler.

Generally Closed Canopy with Small Gaps

Closed canopy conditions favor a suite of mature forest-nesting bird species that include: the Ovenbird, Black-throated Green Warbler, and Brown Creeper. A generally closed canopy has >75-80% closure with relatively small gap openings (diameters up to two times canopy height) throughout. These openings will mimic small natural disturbances and create opportunities for regenerating intermediate- and shade-tolerant tree species. Regeneration in these smaller openings provides a continual supply of an ephemeral nesting and foraging habitat for birds such as Black- throated Blue Warbler, Wood Thrush, and Veery. The distribution and concentration of these openings may vary, but mature forest conditions will be maintained on the whole.

Large-Diameter Trees

Large-diameter cavity trees are critical for larger cavity nesting species including owls and Pileated Woodpeckers. Some large-diameter (24"+ DBH) trees should be present in the forest. Some of these may be financially mature acceptable growing stock (AGS), and others may be senescent or declining unacceptable growing stock (UGS) that may be retained as legacy and wildlife trees. Structurally-sound, large-diameter trees are important stick nest sites for woodland raptors, such as the Northern Goshawk.



YOUNG FOREST HABITAT

For the purposes of forest bird habitat, a young forest is defined as a 1+ acre area of dense, regenerating forest with an open canopy (< 30% cover) that is less than 20-30 feet in height. It may contain shrubs and herbaceous growth as well as sufficient vertical structure to support a variety of young forest bird species. This dense young forest "structure" can be mimicked in a shrubland landscape also, but for the purposes of forestry is most likely to be encountered in a regenerating forest post-treatment.

Young, regenerating forests are critical for a suite of birds that breed exclusively in young forest habitats, taking advantage of the high density of stems-per-acre and the abundant insect forage. Numerous mature forest breeding birds, such as Black-and-white Warblers and Wood Thrushes, will also target these same habitats to forage during the post-fledging period (Anders et al. 1998, Marshall et al. 2003, Vitz & Rodewald 2006); however, it is the shrub layer, whether found in early successional forest or in a mature forest, that benefits these species the most (Rodewald 2013). These young forest habitats are ephemeral, benefitting some birds for as little as 1-2 years (see Table 1), so periodic use of silvicultural treatments such as clearcutting is one way to maintain a range of young forest conditions well-distributed across the landscape. Young forest habitat patches of all sizes will benefit birds in Massachusetts, from small 1 acre openings distributed throughout a forested matrix, to large openings in excess of 25 acres (Litvaitis 2006, Askins et al. 2007, Schlossberg & King 2008, Shake et al. 2012).

Strategic Location

Landscape context is especially important to consider to maintaining an appropriate balance of habitat conditions – intact mature forests are maintained, and opportunities to build off of existing early successional habitats are not missed.

- Building off of existing early successional habitat, such as powerline corridors or abandoned beaver ponds, with large forest blocks nearby will enhance the value of the habitat.
- Consider a gradient of age classes by creating new young forest adjacent to sapling/pole stands.
- Consider avoiding large openings within a highly fragmented landscape (e.g. residential & commercial development).
- When considering young forest habitat projects, special attention should be given to the presence of aspen (quaking and bigtooth), which creates dense thickets of root-sprouts when cut that are particularly beneficial to Ruffed Grouse.
- The presence of soft mast-producing shrubs (e.g. dogwood species, highbush blueberry, viburnum species, etc.) should be retained as these will contribute to the early successional habitat structure as well as add to the diversity and temporal availability of available forage.

Shape of openings

When creating young forest habitat patches, managers should focus on creating square or circular patches rather than rectangular or irregularly shaped patches to reduce to the amount of edge in the patch. Both shrubland and mature forest birds have been found to prefer interior young forest habitat (≥164 ft from edge) to edge habitat (Rodewald & Vitz 2005, Vitz & Rodewald 2006, Schlossberg and King 2008, Shake et al. 2011). Soft edges between forest and openings are also better than hard edges for nesting and foraging birds. Soft edges provide mature and young forest birds with protection from nest predators and brood parasitism by Brown-headed Cowbirds (Hagenbuch et al. 2012).

Complex structure

All young forest openings should emphasize retention of coarse woody material, snags, and cavity trees to provide habitat structure and diversity. Larger openings (> 5 ac.) should also retain groups of legacy trees.

Regeneration of commercial tree species

Openings should regenerate to a mix of commercial tree species of at least 1000 seedlings or saplings per acre within 5 growing seasons.

Number of years after clearcutting an eastern deciduous forest that breeding, early-successional birds first appear, become common, and then decline.

Species	First Appear	Become Common	Decline
Ruffed Grouse	10	15	20
Veery	3	10	20
Chestnut-sided Warbler	2	4	10
Black-and-white Warbler	3	10	*
Canada Warbler	5	15	*
White-throated Sparrow	1	2	*

*Present until next cutting cycle

Excerpt of a table from DeGraaf & Yamasaki (2003)

ALL FORESTS

Dead Woody Material

Downed tree tops and brush piles provide foraging habitat, singing perches, and cover for a variety of bird species, such as the White-throated Sparrow and Veery. Downed woody material also provides important habitat for insects and other songbird prey items. Dead woody material should be present in moderate to high amounts. Large downed coarse woody material (>4" diameter) is an important habitat feature for some forest birds, such as Ruffed Grouse which use downed logs as drumming sites during the breeding season.

Snags and Cavity Trees

Snags and cavity trees provide important nesting and foraging sites for bird species such as nuthatches, owls, and woodpeckers, like the Yellow-bellied Sapsucker. Standing trees that are dead and/or contain cavities should be present in all diameter classes, with at least six snags per acre with one tree > 18" DBH and three > 12" DBH. Strive for relatively even distribution of cavity trees as most cavity users are territorial.

Native Species Diversity

Species composition should reflect the range of species that are part of the natural community type. Native species diversity is important for regeneration, forest health, and for forest birds that rely on the structure certain vegetation species provide for foraging and nesting. For example, yellow birch has been shown to be preferentially chosen by several species of insect-eating songbirds for foraging.

Non-Native Invasive Plant Species

Consideration and control of non-native, invasive plant species should be a management objective for improved habitat as well as a silviculture objective. Non-native, invasive plants, such as bush honeysuckles, buckthorn, autumn olive, and Japanese barberry, present a variety of threats to forest health in Massachusetts and the northeast. Although some species of native forest birds successfully use these shrubby, woody plant species as nesting sites and eat their fruits, the fruits generally have low nutritional value (Ingold & Craycraft 1983) and the invasive plants reduce the diversity of other nesting and foraging options in forest ecosystems (Schmidt & Whelan 1999, Ortega et al. 2006). Overall, non-native, invasive plant species degrade the quality of native forest bird habitat in our region (Schmidt & Whelan 1999, Ortega et al. 2006).

Softwood Inclusions

In a northern hardwood forest, softwoods diversify habitat conditions available to birds and other wildlife species. Softwood inclusions often provide increased structural complexity as well as varied foraging and nesting opportunities. Softwood inclusions are particularly beneficial for species such as the Black-throated Green Warbler, Blackburnian Warbler, and Blue-headed Vireo.

Litter Layer

This forest layer is an important habitat attribute for birds, including the Ovenbird which builds its nest using deciduous litter, as well as the Wood Thrush and Eastern Towhee, which forage for soil macro-invertebrates on the forest floor.

Assessment and Inventory

This publication is intended to be used with the forester's inventory and assessment of stand conditions to help design stand treatments. The companion document *Forest Bird Habitat Assessment: A Guide to Integrating Bird Habitat Data into a Massachusetts Forest Inventory* is designed to help foresters integrate inventory and assessment of forest attributes particularly important to breeding birds into a conventional forest inventory. Since forest bird survival and breeding success is dependent not only on the habitat conditions at the stand level, but also the surrounding landscape, it is necessary to consider the proportions and sizes of stand types and successional stages on the parcel and associated landscape.

The silvicultural options presented in this document will work best when timber inventories include consideration of habitat features important to songbirds, including:

Landscape Level

- Proximity to open space, fields, shrubswamps, powerline corridors.
- Extent of agricultural land and/or developed land (edge and forest fragmentation).
- Unfragmented forest within 1.2 square miles
- Relative proportions and distributions of forest types and age classes.

Stand Level

- Understory vegetation, including presence of invasive, non-native species (0-5 feet from the ground).
- Plant species composition, including presence of Rubus spp. and other soft-mast producing species.
- Midstory vegetation (6-30 feet from the ground).
- Canopy height of dominant and co-dominant.
- Canopy closure of dominant and co-dominant.
- Coarse and fine woody material.
- Snags and cavity trees.
- Deciduous leaf litter.
- Presence of rocky bottom streams.
- Presence and condition of forested wetlands.
- Abundance and diversity of bird nests.

This section of the publication presents generalized descriptions of three different hypothetical – but commonly encountered – forest stand conditions. These include even-aged or uneven-aged poletimber and sawtimber stands as described in Leak, Solomon, and DeBald (1987) (NE-603). Additional example stand descriptors are also included for each condition to more fully mirror typical stand descriptions as presented in forest management plans.

Each of the three example stand conditions is then followed by two or three silvicultural options for integrating timber and songbird habitat management in such a stand. These are not prescriptions and are not intended to be applied indiscriminately. They are intended as options for consideration. The forester is encouraged to compare the outputs of his or her own stand inventory and assessment with these example stand conditions. If found to be similar to any of the example stands, the forester may consider the accompanying silvicultural option for possible application or adaptation under the example management objectives provided that they reflect those of the forester and landowner.

Stand Condition I Northern Hardwood (or Mixedwood) Poletimber Stands with Small Sawtimber and High Stem Quality and High Stocking

AGS > 40ft^2/acre (hardwood) or 60ft^2/acre (mixedwood)

But, AGS 12"+ < 25ft^2/acre AGS (hardwood) or 40ft^2/acre (mixedwood)

Total BA > 100ft^2/acre (hardwood) or 130ft^2/acre (mixedwood)

Example Stand Data

Mean Stand Diameter: 8.5"
Trees Per Acre: 240
Total Basal Area/Acre (BA): 115 ft^2
AGS Basal Area/Acre: 72 ft^2
Overstocked, above B-line
Site Class: I-II
Current Age Class Distribution:
even-aged or two-aged

Example Stand Notes

Stem exclusion stage. Lacking significant regeneration; 0-5-foot layer minimally occupied and where present it is heavily browsed and/or of non-commercial species. Minor and scattered softwood component. Minimal recent disturbance. Generally a closed canopy exists and large-diameter (>20" DBH) trees are lacking. Coarse woody material is lacking. Snags exist but in low densities and typically of small diameter (<16" DBH).

Potential Silvicultural Objectives

integrating timber and forest bird habitat:

Increase sawtimber quantity, quality, and volume increment.

Maintain a diversity of plant species in all forest layers, with particular attention toward both commercial tree species (e.g. yellow birch, red oak) and non-commercial species (e.g. mountain laurel, hobblebush, striped maple) valuable to wildlife.

Manage seed-producing trees and shrubs for a continuous source of wildlife food and high-quality seed for regeneration.

Increase softwood component where viable.

Increase abundance of:

- large-diameter snags (one tree > 18" DBH and three > 12" DBH per acre) ,
- cavity trees (24"+ DBH),
- downed woody material (>4"diameter).

Possible Silvicultural Options

1A Crop Tree Release with Canopy Gap Formation
1B Variable-Retention Thinning

Crop Tree Release with Canopy Gap Formation

Favors mature forest nesting birds

Identify 30-70 crop trees per acre with particular value for timber and wildlife.

Release crop trees from competing vegetation.

- Pole-sized crop trees should receive a 2-3-sided, 5-10-foot crown release.
- Sawtimber-sized crop trees should receive a 1-3-sided crown release.

Between crop trees, create circular canopy gaps ranging from 30 -75 feet in diameter on 5-15% of the area at each entry. Within gaps, all poor-quality stems >1 inch DBH should be cut.

CANOPY GAPS BETWEEN CROP TREES SHOULD RANGE IN DIAMETER FROM 30-75 FEET.

Notes & Considerations

Expand crop tree definition to include:

- tree species of particular value for foraging birds (e.g. yellow birch).
- tree conditions of particular value for forest birds (e.g. large crowns for perching, nesting, foraging).
- retention of under-represented species (especially soft-mast producers, softwood inclusions, yellow birch and red oak).

Manage to increase the production of seed and wood volume increment; favor a diversity of seed-producing native tree and shrub species and free them from overtopping and less-productive individuals.

Trees with cavities or dens should only be cut to release high-quality crop trees. Consider girdling to release the crop trees without removing cavity or den trees.

Locate gaps to release advance regeneration, to remove clusters of high-risk, low-vigor, or low-value trees, and to avoid easily disturbed, sensitive sites.

Forest Bird Species that Might Benefit

Condition	Duration Post-treatment	Benefiting Bird Species
Improved foraging gaps in open mid-story associated with full-sided releases	1-30 years	Eastern Wood-Pewee
Increased understory density	3-15 years	Black-throated Blue Warbler Canada Warbler Ruffed Grouse Veery Wood Thrush
Enhanced softwood component	5+ years	Black-throated Green Warbler Canada Warbler White-throated Sparrow
Increased growth and vigor in canopy trees	5+ years	Black-and-white Warbler Wood Thrush
Increased midstory density	15+ years	Canada Warbler Wood Thrush

Use successive cuttings with long 20+ year or indefinite regeneration periods to establish new cohorts or release advance regeneration in groups and/or patches (0.1ac – 0.25 ac) which are gradually expanded at each successive entry. Use crop tree release in stand matrix between groups to increase growth and quality and initiate advance regeneration.

AFTER HARVEST, CLUSTERS OF LOW-RISK, HIGH VIGOR TREES REMAIN INTACT WITH MIXED-SIZED OPENINGS SCATTERED THROUGHOUT.

Notes & Considerations

Focus removals on suppressed, intermediate, and the poorest quality co-dominant trees (least desirable competitors, high risk, low vigor).

Retain some senescent paper birch, aspen (if present) or dry hardwood cavity trees >9" DBH in which yellow-bellied sapsuckers and/or northern flickers may excavate nesting cavities.

Retain inclusions of mountain laurel (if present). It provides dense cover for nesting and is strongly associated with the Black-throated Blue Warbler.

Recruit snags by girdling some poor quality dominants; leave worst-quality cut stems in woods as downed woody material.

Identify and retain trees with well-developed heart rot in the bole or with dead limbs greater than 4" in diameter as potential cavity trees.

Strive for relatively even distribution of cavity trees; most cavity users are territorial.

Thinning throughout the strata will help retain vertical diversity. Creation of openings (<1/3ac) will help enhance structural diversity.

Forest Bird Species that Might Benefit

Condition	Duration Post-treatment	Benefiting Bird Species
Enhanced foraging in open midstory and gaps	1-30 years	Eastern Wood-Pewee
Increased understory density	3-15 years	Black-throated Blue Warbler Ruffed Grouse Wood Thrush
Enhanced softwood component	5+ years	Black-throated Green Warbler
Increased growth and vigor in canopy trees	5+ years	Black-and-white Warbler Wood Thrush
Enhanced cavity tree nest sites	5+ years	Yellow-bellied Sapsucker
Increased midstory density	15+ years	Wood Thrush

Stand Condition 2 Northern Hardwood (or Mixedwood) Poletimber Stands with Small Sawtimber with Poor Stem Quality and High Stocking

AGS <40 ft^2/acre (hardwood) or <60 ft^2/acre (mixedwood)

Example Stand Information

Mean Stand Diameter: 8.6"
Trees Per Acre: 210
Total Basal Area/Acre (BA): 105 ft^2
AGS Basal Area/Acre: 38 ft^2
Overstocked, above B-line
Site Class: II-III
Current Age Class Distribution:
even-aged

Example Stand Notes

Species mix is not ideal. Bad site match and/or low proportion of desirable commercial species. Stem quality is fair to poor. Stem exclusion stage with scattered, small pockets of understory regeneration. Generally closed canopy. Large-diameter (>20" DBH) trees lacking. Minimal coarse woody debris. Snags exist but in low densities and of small (<16") diameters. Evidence of past high-grading. Site conditions not ideal, including shallow to ledge, dry, or excessively wet areas.

Potential Silvicultural Objectives

integrating timber and forest bird habitat:

Increase sawtimber quantity, quality, and volume increment.

Reduce proportion of unacceptable growing stock.

Increase understory density.

Increase both horizontal and vertical heterogeneity.

Increase tree species diversity; maintain softwood inclusions where possible.

Increase amounts of downed woody material of all sizes.

Retain some large unmerchantable trees especially those with visible rot/defects for future cavity/snag trees.

Given poor stem-quality, strive for intermediate canopy closure of 30-80% canopy cover of dominants and co-dominants.

Possible Silvicultural Options

2A Expanding-Gap Group Shelterwood
2B Small-Group and Single-Tree Selection

Use successive cuttings with long 20+ year or indefinite regeneration periods to establish new cohorts of mid to shade tolerant species or release advance regeneration in groups and/or patches (.1 to 1 ac) which are gradually expanded at each successive entry. Use crop tree release in between groups to increase growth and quality and initiate advance regeneration.

GAPS CREATED DURING FIRST ENTRY WILL BE GRADUALLY EXPANDED AT EACH SUCCESSIVE ENTRY.

Example Silvicultural Objectives

Particularly applicable in degraded stands as transition strategy to more complex structure and composition.

May appear similar to group selection but only after first entry; thereafter new cohorts are established immediately adjacent to previous ones.

As groups expand consider thinning along the edge of openings to create a soft edge.

Dominant cover must contain an adequate quantity and distribution of seed trees of desirable species, vigor, and quality.

Stand must be relatively windfirm.

Retain groups of acceptable growing stock. Locate and create gaps/patches through removal of clusters of high-risk, low-vigor, low-value trees, to release advance regeneration, and to avoid sensitive sites.

Offers increased opportunity to regenerate mix of species including mid-tolerant species such as yellow birch.

Recruit snags by girdling some poor-quality dominants; leave worst-quality cut stems in woods as coarse woody debris.

Forest Bird Species that Might Benefit

Condition	Duration Post-treatment	Benefiting Bird Species
Enhanced foraging in open	1-30 years	Eastern Wood-Pewee
midstory and gaps	1-30 years	Eastern Wood-Pewee
Increased understory density	3-15 years	Black-throated Blue Warbler
		Canada Warbler
		Ruffed Grouse
		Veery
		White-throated Sparrow
Enhanced softwood component	5+ years	Canada Warbler
		White-throated Sparrow

Use variable-sized openings from 0.10 acre to 2.0 acres on a 12-15 year cutting cycle with single-tree selection and crop tree release in between groups to control quality and recruit advance regeneration.

A GROUP 1X TREE HEIGHT IN DIAMETER PLACED TO MIRROR AERIAL EXTENT OF ADVANCE REGENERATION. FINE WOODY DEBRIS PILES WILL PROVIDE COVER AND FORAGING OPTIONS FOR SONGBIRDS.

Notes & Considerations

Owing to disturbance patterns and variations in site conditions, trees initiate and establish themselves in groups. Look for, identify, and manage such groups that occupy the stand.

Locate groups for removal to release advance regeneration, to remove clusters of high-risk, low-vigor, low-value trees, and to avoid sensitive sites.

Locate groups along skid roads.

Mid- and tolerant-species are particularly dependent on advance regeneration – use groups to release.

Leave 70 ft2/acre in matrix between groups, including >35 ft2/acre in sawtimber.

Recruit snags by girdling some poor-quality dominants; leave worst-quality cut stems in woods as coarse woody debris.

Harvest no more than 1% of the stand's area for each year between entries (e.g., 12% of stand harvested during 12-year entry period).

Forest Bird Species that Might Benefit

Condition	Duration Post-treatment	Benefiting Bird Species
Enhanced foraging in midstory and gaps	1-30 years	Eastern Wood-Pewee
Increased understory density	3-15 years	Black-throated Blue Warbler Canada Warbler Ruffed Grouse Veery White-throated Sparrow
Creation of young forest in groups 1+ acres in size	5-15 years	Chestnut-sided Warbler Ruffed Grouse
Enhanced softwood component	5+ years	Canada Warbler White-throated Sparrow

Stand Condition 3 Northern Hardwood (or Mixedwood) Small Sawtimber Stands with Poor Stem Quality and Variable Stocking

Example Stand Information

Mean Stand Diameter: 11.2”
Trees Per Acre: 145
Total Basal Area/Acre (BA): 110 ft^2
AGS Basal Area/Acre: 48 ft^2
Overstocked, above B-line, but highly variable Site Class: I-II
Current Age Class Distribution: even-aged

Example Stand Notes

Degraded stand. Species mix is not ideal. Bad site match and/or low proportion of desirable commercial species. Stem quality is good to poor, with lesser proportion good. Overstocked, above B-line on hardwood stocking guide, but highly variable across stand. Regeneration is lacking in areas, often patchy; 0-5’ layer present in scattered pockets, but largely absent, often with undesirable or non-commercial species. Coarse woody material is generally lacking but may include smaller fragments from senescent early-successional species and damaged individuals of others. Snags exist but are scattered and typically are of small diameters.

Potential Silvicultural Objectives

integrating timber and forest bird habitat:

Increase sawtimber quantity, quality, and volume increment (on best stems).

Maintain a diversity of plant species in all forest layers, with particular attention toward both commercial tree species (e.g. yellow birch, red oak) and non-commercial species (e.g. mountain laurel, hobblebush, striped maple) valuable to wildlife.

Reduce proportion of unacceptable growing stock.

Increase understory density of desirable species. Increase vertical heterogeneity.

Increase amounts of downed woody material of all sizes.

Retain some large unmerchantable trees; girdle some to recruit new snags.

Retain softwood inclusions where present.

Regeneration is a priority.

Possible Silvicultural Options

3A Shelterwood with Reserves
3B Mixed Intermediate Treatments
3C Clearcut with retention, Clearcut with Reserves

Establish or release a new cohort, creating two-aged (or multi-aged) residual structure using seed cutting to remove 40-60% of original basal area, leaving 40-50 ft^2/acre in residual sawtimber class to shade/protect seedling development. Initiate removal cut when at least 5,000 new trees per acre reach free to grow positions (4-6'). Leave a portion (5-15%) of the older age class (especially large-diameter trees) for more than 25% of the rotation (or indefinitely), irregularly dispersed.

DENSE UNDERSTORY CONDITIONS CREATED POST SEED CUTTING AND PRIOR TO REMOVAL CUTTING ENHANCE HABITAT CONDITIONS FOR SOME SONGBIRD SPECIES.

Notes & Considerations

Select reserve trees carefully based on species, size, vigor, form, and windfirmness.

Reserve trees should be of dominant or upper co-dominant crown classes, with few dead or dying main branches and expected to live 50-80 years longer.

Best success when used with desirable advance regeneration.

Where interfering vegetation is abundant, site preparation/weeding may be necessary prior to seed cutting.

Use good initial access layout so it can be used again and to minimize damage to new age class.

Leaving patches and bands of undisturbed overstory to protect special microsite features such as seeps, ledges, shallow soils will add diversity and structure to the new, even-aged forest.

Pre-treat for control of non-native, invasive plants.

Forest Bird Species that Might Benefit

Condition	Duration Post-treatment	Benefiting Bird Species
Creation of intermediate canopy and potential nest sites	0-15 years	Yellow-bellied Sapsucker
Increased understory density	3-15 years	Canada Warbler Ruffed Grouse Veery White-throated Sparrow
Creation of young forest in groups 1+ acres in size	5-15 years	Chestnut-sided Warbler Eastern Towhee

Use a combination of free thinning with liberation cuttings, cleanings, and weedings to treat groups of trees within the stand, as dictated by existing stand conditions.

FREE THINNING OF HIGH QUALITY DOMINANTS AND CO-DOMINANTS WITH LIBERATION CUTTING TO RELEASE ADVANCE REGENERATION.

Notes & Considerations

Particularly applicable in highly variable stands with high proportion of unacceptable growing stock and scattered occurrences of desirable species.

Expand croptree criteria to include species of particular value for foraging birds (e.g. yellow birch), or condition (e.g. large crowns for perching, nesting, foraging), overstory inclusions of softwooods in hardwood dominated stands or under-represented species (especially soft mast producers such as black cherry) in more pure hardwood stands.

Focus removals on defective, high-risk, and low-value trees especially to release an understory of more desirable species.

Favor most vigorous, best-formed dominant and co-dominant individuals.

Forest Bird Species that Might Benefit

Condition	Duration Post-treatment	Benefiting Bird Species
Enhanced foraging in open midstory and gaps	1-30 years	Eastern Wood-Pewee
Increased understory density	3-15 years	Black-and-white Warbler
		Black-throated Blue Warbler
		Canada Warbler
		Ruffed Grouse
		Veery
		Wood Thrush
Enhanced softwood component	5+ years	Black-throated Green Warbler
		Canada Warbler
Increased growth and vigor in canopy trees	5+ years	Black-and-white Warbler
		Wood Thrush
Increased midstory density	15+ years	Canada Warbler
		Wood Thrush

Use Clearcut with retention or Clearcut with Reserves in low quality, storm damaged, insect or disease damaged or previously high graded stands. Cut the majority of stems over 2" in diameter. When using a clearcut retain legacy trees, generally 10 sq.ft. ba/acre. When using clearcut with reserves retain 10 to 30 sq.ft. ba/ acre scattered throughout the stand with uncut groups.

DENSE UNDERSTORY CONDITIONS CREATED POST SEED CUTTING AND PRIOR TO REMOVAL CUTTING ENHANCE HABITAT CONDITIONS FOR SOME SONGBIRD SPECIES.

Notes & Considerations

Particularly applicable in stands with high proportion of unacceptable growing stock and scattered occurrences of desirable species.

Best option for shade intolerant species such as aspen and cherry. Size and shape of openings is dependent upon seed source, site, and specific objectives. When relying upon seeding from the surrounding stand then the maximum size shall be 5 acres. The site must regenerate to at least 1,000 seedlings/ saplings per acre within 5 years.

In all stands:

Protect areas of advance regeneration

Leave all existing down woody material. Dead woody material should be present in moderate to high amounts, leave the majority of tops on site.

Large downed coarse woody material (>4" diameter) is an important habitat feature for some forest birds, retain some larger cut material on site.

Maintain scattered saplings and small poles throughout which may be used as perches.

Retain large-diameter snags

Retain live trees with existing cavities

Create non-linear, soft edges

Larger Clearcuts (> 5 ac)

Clearcut with Reserves is most applicable for openings greater than 5 acres. Locate large clearcuts (> 5 ac) adjacent to existing open space, brushy habitat, shrub swamps.

In larger clearcuts, leave patches and bands of undisturbed overstory (3% to 10% of the area harvested) to protect special microsite features such as seeps, ledges, shallow soils which will add diversity and structure to the new, even-aged forest. Focus retention patches with the following trees as their nuclei:

- Existing cavity trees exceeding 18 inches DBH or active den trees
- Broken-topped live trees exceeding 12 inches DBH
- Secure standing dead trees, especially those with top-attached bark flaps
- Living, large aspen and white pine, red spruce, eastern hemlock, sugar maple, beech, yellow birch, elm and oaks. Except for aspen, these trees will persist for long periods as standing dead trees.

Smaller Clearcuts (<5 ac)

Clearcut with retention is most applicable for smaller openings (<5 ac).

In small clearcuts (<5 acres), retain scattered canopy trees and small groups of trees in order to achieve desired regeneration while providing structure for bird habitat.

Forest Bird Species that Might Benefit

Condition	Duration Post-treatment	Benefiting Bird Species
Creation Canopy cover 0-30%	1-20 years	Eastern Towhee Chestnut-sided Warbler White-throated Sparrow
Increased understory density	10-20 years	Canada Warbler Ruffed Grouse Veery
Creation of young forest in groups 2.5+ acres in size		Eastern Towhee

Silviculture

Retain, release, and regenerate soft mast species such as black cherry, serviceberry, and apple that produce food sources in late summer which are critical for preparing for successful migration. Rubus spp that dominate openings are also important sources of soft mast for birds.

Retain, release, and regenerate yellow birch (Betula alleghaniensis) whenever possible since the branches and foliage of this species are preferentially chosen foraging substrates for many insect-eating bird species including Blackburnian Warbler, Black-throated Green Warbler, and Scarlet Tanager.

Retain softwood inclusions in hardwood stands and hardwood inclusions in softwood stands. Overstory inclusions resulting from site conditions are more practical to maintain than those that are a result of disturbance history.

Control and monitor invasive plants. Migratory songbirds will eat buckthorn, autumn olive, barberry, and honeysuckle berries during the post-breeding season when they are fueling up for fall migration, but the berries are not nutritious.

When non-native invasive plants are present, strive to **locate larger groups/patches near already disturbed areas** (e.g. agricultural lands) and away from interior sections.

Use best practices to prevent spread of non-native invasive plants including pretreatment if needed.

Maintain closed-canopy buffers along beaver ponds, wetlands, and riparian areas. Layout riparian buffers to have variable widths based on stream morphology; avoid abrupt edges. Follow minimum guidelines provided by the "Massachusetts Forestry Best Management Practices" manual.

Retain a minimum of six snags per acre with one tree > 18" DBH and three > 12" DBH and designate 3-5% of total stocking as potential cavity trees and source of future snags.

Where lacking, actively recruit snags through girdling.

Use snags and potential cavity trees as nuclei for retained patches during larger cuttings. Retained patches may be islands or peninsulas extending from adjacent stands.

Use woodland seeps and springs, which are early-season sources of insects, green vegetation, and earthworms as nuclei for uncut patches to retain snags, cavity trees, and other site-specific features. Retained patches may be islands or peninsulas extending from adjacent stands.

Recognize that vertical structure is naturally limited in early and mid-successional stages. Look for opportunities to enhance vertical structure over time.

Protect vernal pools and riparian buffers when laying out extent and location of openings.

Cluster intermediate treatments conducted in the matrix in between groups along trails, and away from openings and sensitive sites.

Manage for age-class diversity over larger ownerships (>200 acres) where opportunities exist.

Operations

Keep woods roads and skid trails <20 feet wide to avoid creating fragmenting barriers for interior forest species, such as the Wood Thrush and Ovenbird.

Incorporate bends and twists into woods roads and skid trails when laying out a new network. Nest parasites such as Brown-headed Cowbirds will travel into forest interiors along straight openings, but will avoid bends.

When feasible, avoid operating during peak breeding season (April 15- August 1 in Massachusetts). See table of breeding dates in the companion document Birds with Silviculture in Mind for individual species.

Operate during winter under frozen conditions when appropriate to protect habitat features such as understory layers, leaf litter, forest floor topography, soils, and woody debris.

Leave as much woody material on site as possible. Avoid whole-tree harvesting when feasible. When appropriate, return landing debris to the woods.

Leave several large downed logs well-distributed throughout the stand to serve as drumming sites for Ruffed Grouse and important habitat for many life forms.

Avoid disturbing existing tip-ups, stumps, and logs during harvest and operations.

Create scattered slash piles of fine woody material where possible post-harvest to enhance songbird cover and foraging opportunities.

Protect shrub patches as well as tree seedlings and saplings during harvesting. Avoid damage to understory layers during harvest and skidding operations by:

- Using directional felling techniques.
- Carefully laying out skid trails to avoid patches of advance regeneration.
- Winching instead of skidding from each stump, when feasible.
- Harvesting when a heavy snowpack is present.

OPERATING IN WINTER, WHEN FEASIBLE, PROTECTS HABITAT FEATURES IMPORTANT TO FOREST SONGBIRDS.

Atlantic Flyway Eastern Forest Priority Birds Breeding in Massachusetts

This list contains forest bird species that have been determined by the National Audubon Society to be of conservation priority in the Northern Forest Biome and the Eastern Deciduous Forest Biome in the Atlantic Flyway. These species are included because they have a large proportion of their global population within one of the biomes and many are declining in their breeding range. Massachusetts is part of both the Northern Forest Biome and the Eastern Deciduous Forest Biome.

Young Hardwood and Mixedwood Forest

American Woodcock
Canada Warbler*
Chestnut-sided Warbler*
Magnolia Warbler
Mourning Warbler
Nashville Warbler
Northern Flicker
Ruffed Grouse*
White-throated Sparrow*
Eastern Towhee*
Least Flycatcher
White-eyed Vireo
Blue-winged Warbler
Carolina Wren

Mature Hardwood and Mixedwood Forest

American Redstart
Blackburnian Warbler
Black-throated Blue Warbler*
Black-throated Green Warbler*
Blue-headed Vireo
Chimney Swift
Eastern Wood-Pewee*
Northern Parula
Ovenbird
Purple Finch
Scarlet Tanager
Veery*
Wood Thrush*
Yellow-bellied Sapsucker*
Black-and-white Warbler*
Northern Saw-whet Owl
Dark-eyed Junco
Red-shouldered Hawk
Tufted Titmouse
Red-bellied Woodpecker
Pine Warbler

Boreal/High Elevation Forest

Blackpoll Warbler
Yellow-bellied Flycatcher

Wetlands and Watercourses

Alder Flycatcher
Swamp Sparrow
Louisiana Waterthrush

**Birder's Dozen species.*

The Birder's Dozen Disturbance and Bird Habitat*

Natural Disturbance Regime	**Management Objective**	**Canopy Over** (co-dominant and dominant trees)	**Deciduous to Mixed Forest**	**Coniferous to Mixed Forest**
Stand-replacing disturbances >1 acres in size	Maintain patches of young forest, 5-15 years old, >1 acre in size	Open (0-30%)	Eastern Towhee Chestnut-sided Warbler Ruffed Grouse	
Canopy gaps and pockets of regeneration 0.25-0.75 acres in size	Create canopy gaps to encourage dense regeneration in pockets 0.25-0.75 acres in size	Intermediate (30-80%)	Black-and-white Warbler Black-throated Blue Warbler Canada Warbler Eastern Wood-Pewee Ruffed Grouse Veery Wood Thrush	White-throated Sparrow Canada Warbler
Small and infrequent disturbances that maintain average of >80% canopy cover	Minimize gap size and frequency. Favor large, old trees and snags. Maintain >80% canopy cover on average over the stand	Closed (80-100%)	Black-and-white Warbler Black-throated Blue Warbler Canada Warbler Eastern Wood-Pewee Wood Thrush Yellow-bellied Sapsucker	Black-throated Green Warbler

* Birder's Dozen birds are grouped according to habitat features with which they have been shown to be strongly associated. Birds may be found in a wider variety of conditions than shown here.

References

This document is a derivative of the Audubon Vermont and Vermont Department of Forests, Parks, and Recreation Foresters for the Birds Toolkit. We made minor modifications to the Vermont toolkit to address Massachusetts forest conditions, priority birds, and forest management practices. Here we reference both the Vermont toolkit and any additional sources the Massachusetts team relied on.

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Adapted by Mass Audubon from
Silviculture with Birds in Mind:
Options for Integrating Timber and Songbird Habitat Management
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